Exercises

Chapter 6.3 # 1, 5, 11

Chapter 11.1 # 1, 2, 7, 9*
* For 9c, the answer in the back is wrong... extra constant and missing a j.

Chapter 11.2 # 1*, 6*, 12
* Sketch the graph of $F$ for these problems. You may use $\alpha = \beta = \gamma = 1$ to graph #6.

Problem A: Give an example of two nonzero vectors whose cross product is zero.

Problem B: The points (1,0,0), (0,1,0), and (0,0,1) form the vertices of an equilateral triangle. Find the area of this triangle.

Problem C: Prove the scalar triple product identity:

$$u \cdot v \times w = v \cdot w \times u = w \cdot u \times v$$

Problem D: For a curve $F(t)$, show that

$$\frac{d}{dt}||F|| = \frac{F}{||F||} \cdot F'$$

by computing $\frac{d}{dt}(F \cdot F)$ in two different ways. Give a geometric interpretation of this statement.

Problem E: Let $F(t) = r \cos(t)i + r \sin(t)j + tk$ be a helix with radius $r$. Find the value of $r$ which maximizes the curvature of $F$.

Problem F: Let $F(t) = e^t \cos(t)i + e^t \sin(t)j$ for $t$ any real number. Graph $F(t)$, the logarithmic spiral. Reparameterize $F$ by the arclength parameter $s$, and compute the length of $F$ for $t$ from $-\infty$ to 0.